FIG. 1

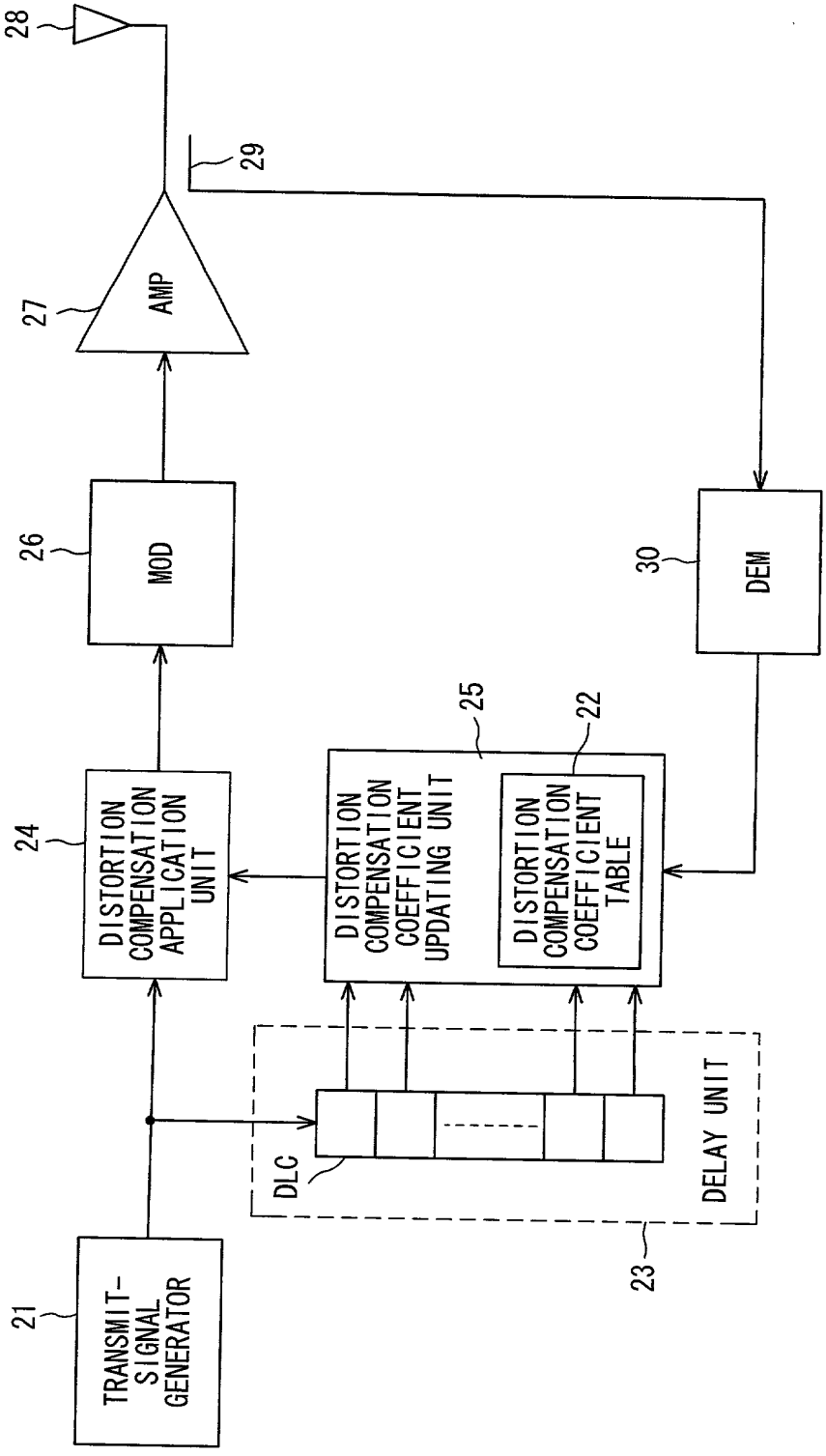

28
29
27
AMP
26
MOD
30
DEM
24
DISTORTION COMPENSATION APPLICATION UNIT
25
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
22
DISTORTION COMPENSATION COEFFICIENT TABLE
DLC
DELAY UNIT
23
21
TRANSMIT-SIGNAL GENERATOR

FIG. 2

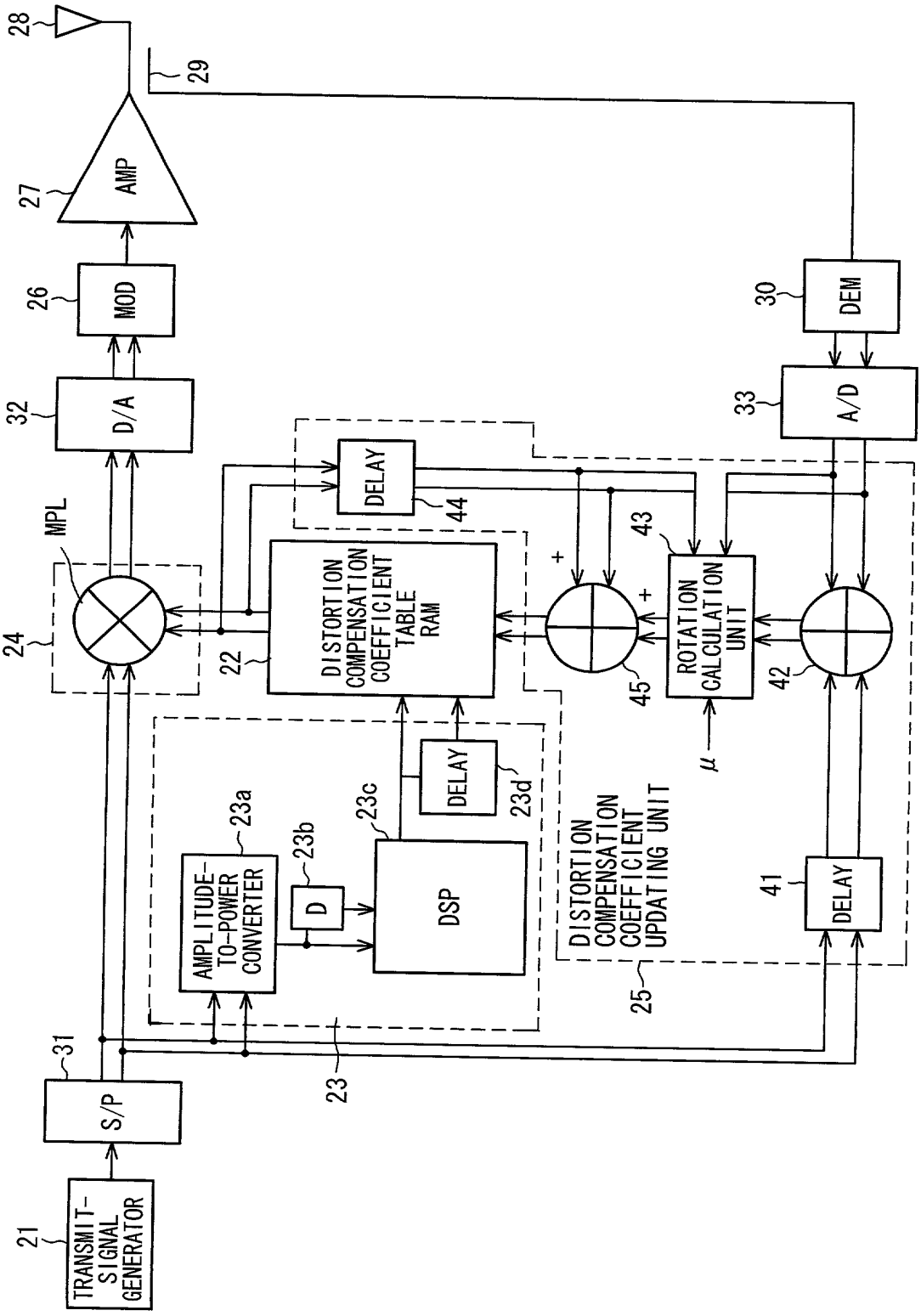

28
29
27
AMP
26
MOD
32
D/A
30
DEM
33
A/D
MPL
24
22
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
DELAY
44
43
ROTATION CALCULATION UNIT
45
42
μ
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
AMPLITUDE-TO-POWER CONVERTER
23a
23b
D
23c
DSP
DELAY
23d
41
DELAY
23
31
S/P
21
TRANSMIT-SIGNAL GENERATOR

FIG. 3

$P_{(t)}$	ΔP	$h(P_{(t)}, \Delta P)$
P_1	ΔP_1	$h(P_1, \Delta P_1)$
	ΔP_2	$h(P_1, \Delta P_2)$
	ΔP_3	$h(P1, \Delta P_3)$
	⋮	⋮
	ΔP_n	$h(P_1, \Delta P_n)$
P_2	ΔP_1	$h(P_2, \Delta P_1)$
	ΔP_2	$h(P_2, \Delta P_2)$
	ΔP_3	$h(P_2, \Delta P_3)$
	⋮	⋮
	ΔP_n	$h(P_2, \Delta P_n)$
P_3 ⋮	⋮	⋮
P_m	ΔP_1	$h(P_m, \Delta P_1)$
	ΔP_2	$h(P_m, \Delta P_2)$
	ΔP_3	$h(P_m, \Delta P_3)$
	⋮	⋮
	ΔP_n	$h(P_m, \Delta P_n)$

FIG. 4

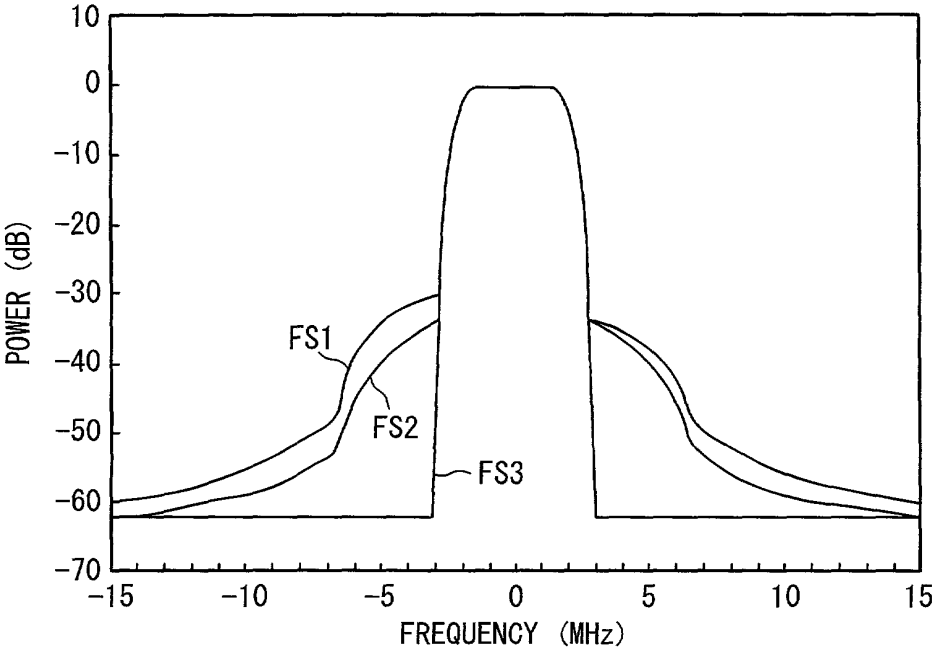


FIG. 5

ITEM	SPECIFICATIONS
CHIP RATE	4.096 Mbps
CARRIER RATE	64 kbps
NUMBER OF MULTIPLEXED SIGNALS	60 CODES
PEAK SUPPRESSION	13.5 CODES
CHIP SHAPING FILTER	ROUTE NYQUIST (α=0.22)

FIG. 6

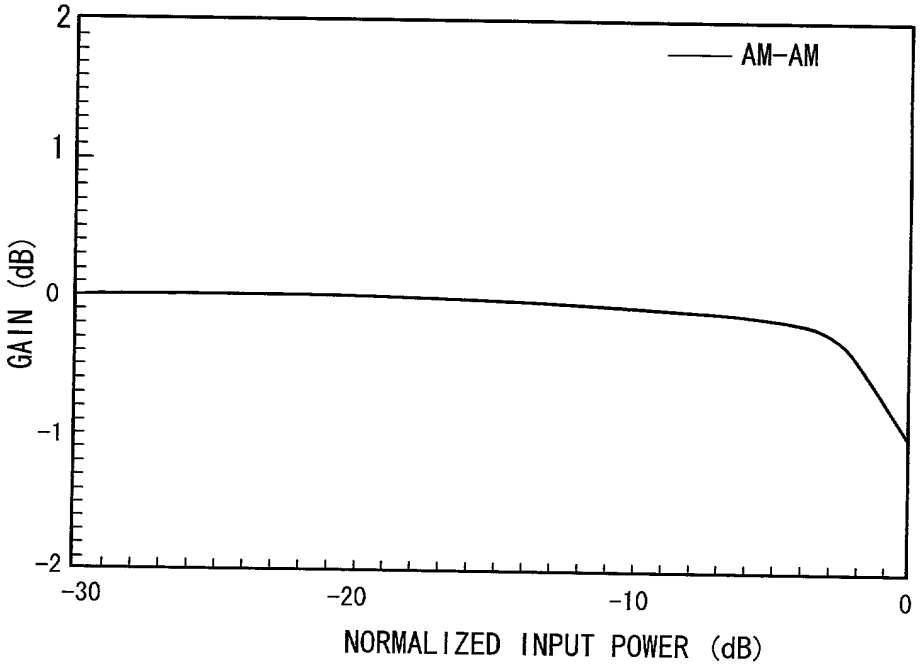

AM-AM
GAIN (dB)
2
1
0
-1
-2
-30
-20
-10
0
NORMALIZED INPUT POWER (dB)

FIG. 7

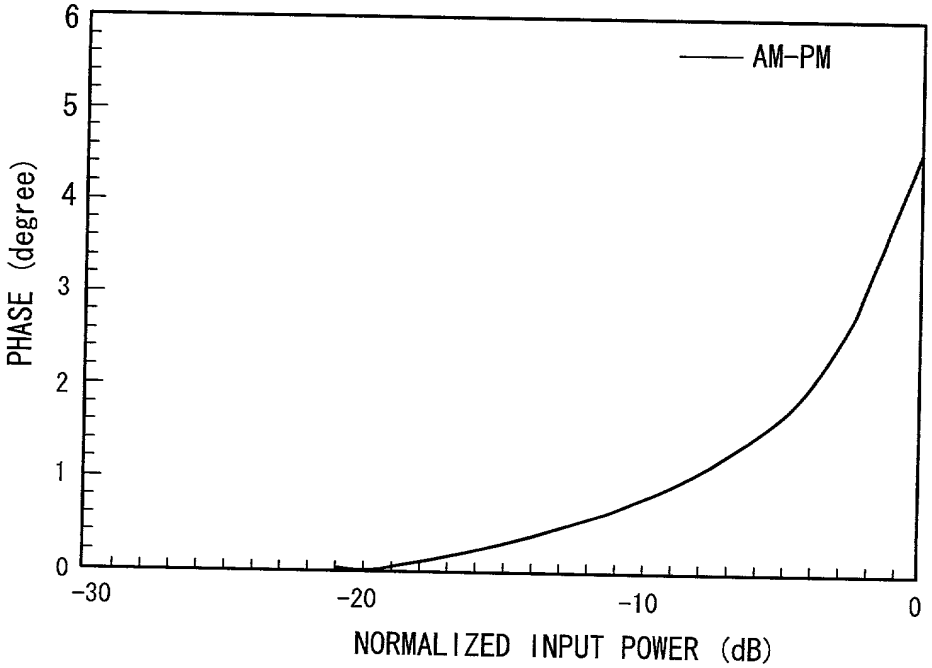

AM-PM
PHASE (degree)
6
5
4
3
2
1
0
-30
-20
-10
0
NORMALIZED INPUT POWER (dB)

FIG. 8

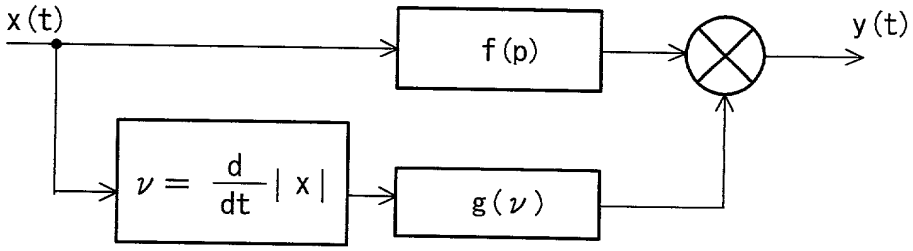


FIG. 9

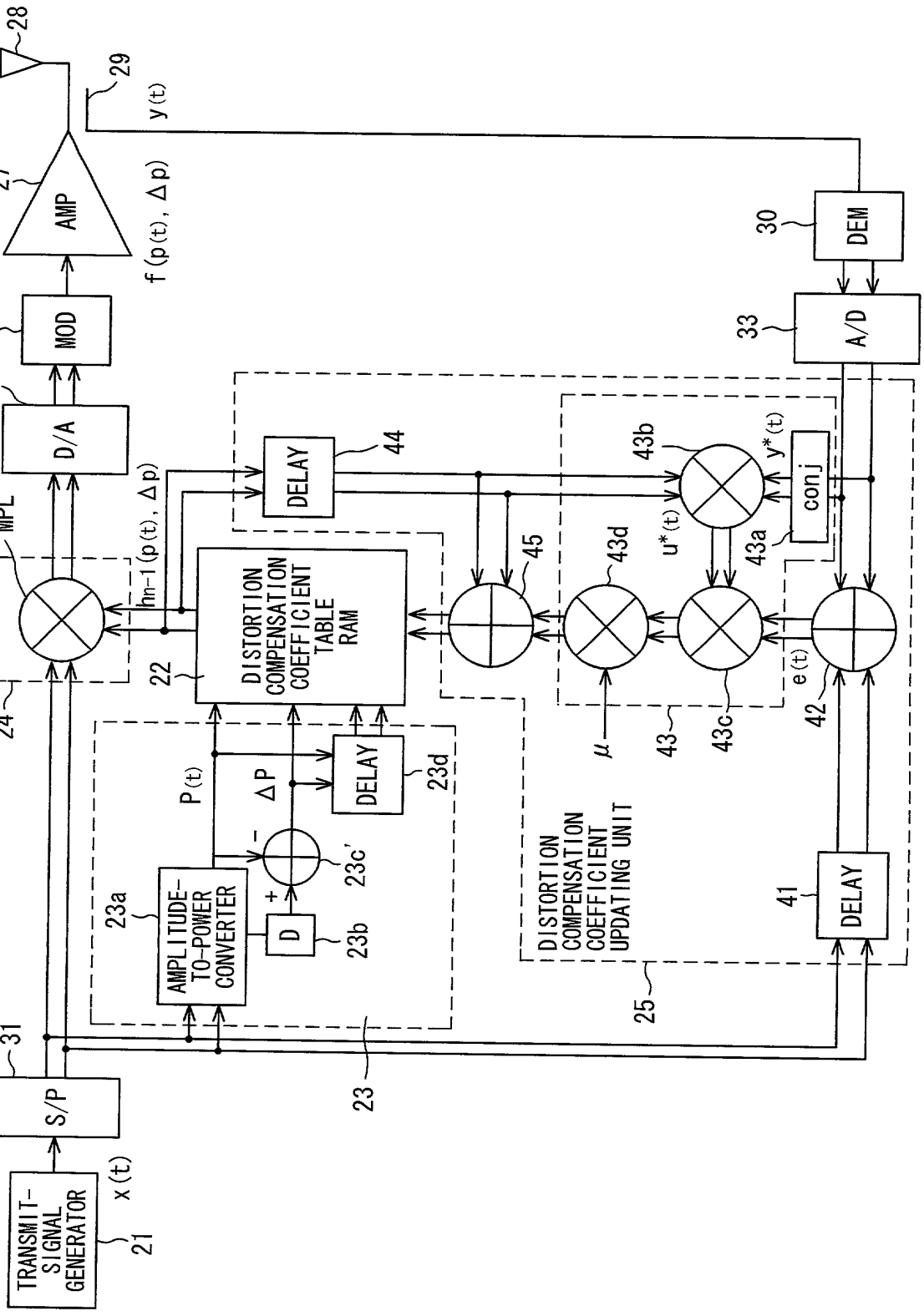

TRANSMIT-SIGNAL GENERATOR
21
x(t)
S/P
31
AMPLITUDE-TO-POWER CONVERTER
23a
D
23b
23c'
P(t)
ΔP
DELAY
23d
23
MPL
24
hn-1(p(t), Δp)
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
22
DELAY
44
45
43d
43b
u*(t)
y*(t)
conj
43a
μ
43
43c
e(t)
42
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
41
DELAY
D/A
32
MOD
26
AMP
27
f(p(t), Δp)
28
29
y(t)
DEM
30
A/D
33

FIG. 10

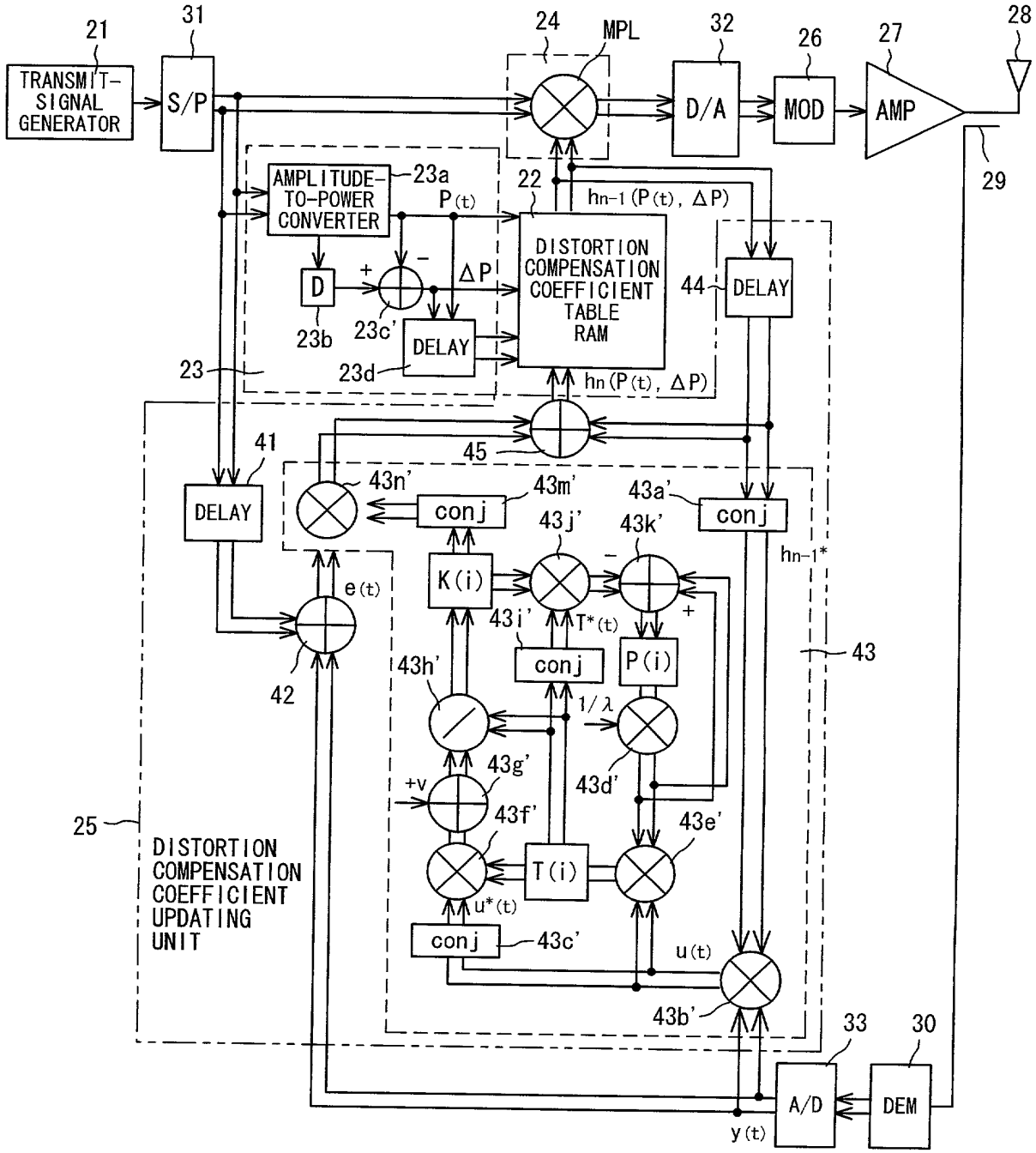

21
TRANSMIT-SIGNAL GENERATOR
31
S/P
24
MPL
32
D/A
26
MOD
27
AMP
28
29
AMPLITUDE-TO-POWER CONVERTER
23a
P(t)
22
hn-1(P(t), ΔP)
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
D
23b
23c'
ΔP
DELAY
23d
23
44
DELAY
hn(P(t), ΔP)
45
41
DELAY
43n'
conj
43m'
43a'
conj
43j'
43k'
K(i)
hn-1*
e(t)
43i'
T*(t)
P(i)
conj
43h'
1/λ
42
43
43g'
+v
43d'
43f'
43e'
25
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
T(i)
u*(t)
conj
43c'
u(t)
43b'
33
30
A/D
DEM
y(t)

FIG. 11

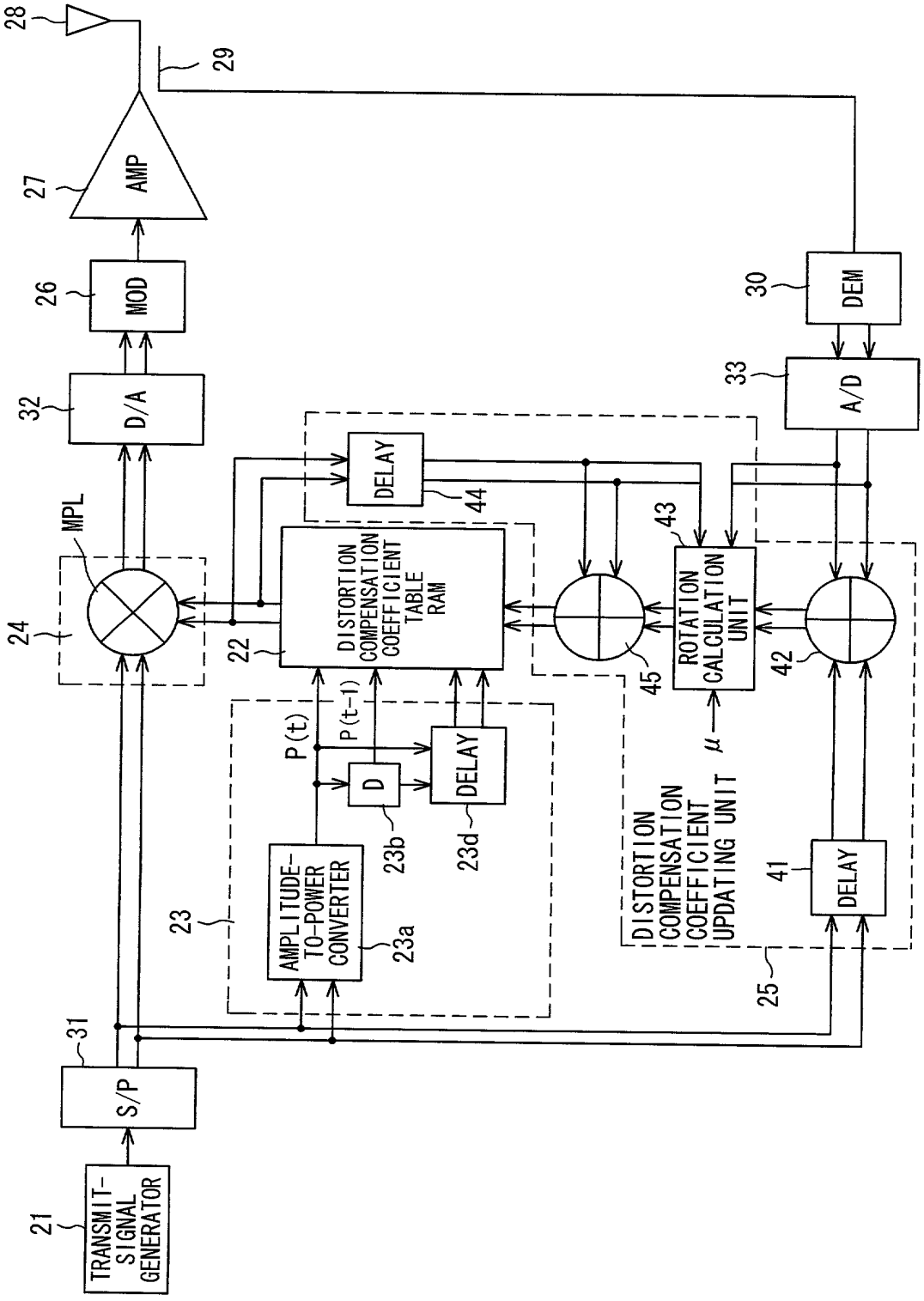

TRANSMIT-SIGNAL GENERATOR
21
S/P
31
AMPLITUDE-TO-POWER CONVERTER
23a
D
23b
DELAY
23d
P(t)
P(t-1)
23
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
22
DELAY
44
MPL
24
D/A
32
MOD
26
AMP
27
28
29
DEM
30
A/D
33
ROTATION CALCULATION UNIT
43
45
42
DELAY
41
25
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
μ

FIG. 12

$P_{(t)}$	$P_{(t-1)}$	$h(P_{(t)}, P_{(t-1)})$
P_1	P_1	$h(P_1, P_1)$
	P_2	$h(P_1, P_2)$
	P_3	$h(P_1, P_3)$
	⋮	⋮
	P_n	$h(P_1, P_n)$
P_2	P_1	$h(P_2, P_1)$
	P_2	$h(P_2, P_2)$
	P_3	$h(P_2, P_3)$
	⋮	⋮
	P_n	$h(P_2, P_n)$
P_3 ⋮	⋮	⋮
P_m	P_1	$h(P_m, P_1)$
	P_2	$h(P_m, P_2)$
	P_3	$h(P_m, P_3)$
	⋮	⋮
	P_n	$h(P_m, P_n)$

FIG. 13

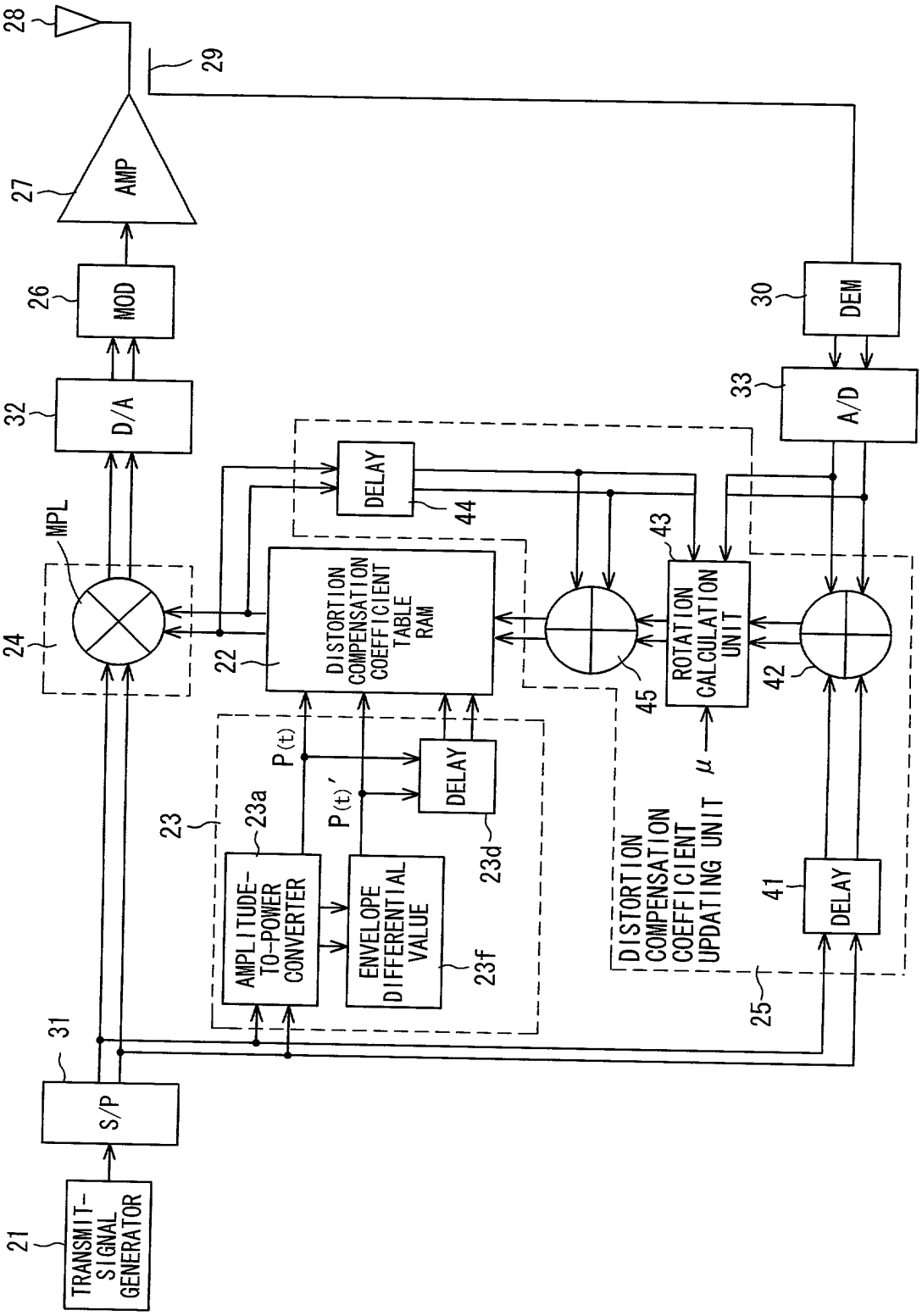

TRANSMIT-SIGNAL GENERATOR
21
S/P
31
AMPLITUDE-TO-POWER CONVERTER
23a
ENVELOPE DIFFERENTIAL VALUE
23f
DELAY
23d
23
P(t)
P(t)'
MPL
24
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
22
DELAY
44
ROTATION CALCULATION UNIT
43
45
μ
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
D/A
32
MOD
26
AMP
27
28
29
DEM
30
A/D
33
DELAY
41
42

FIG. 14

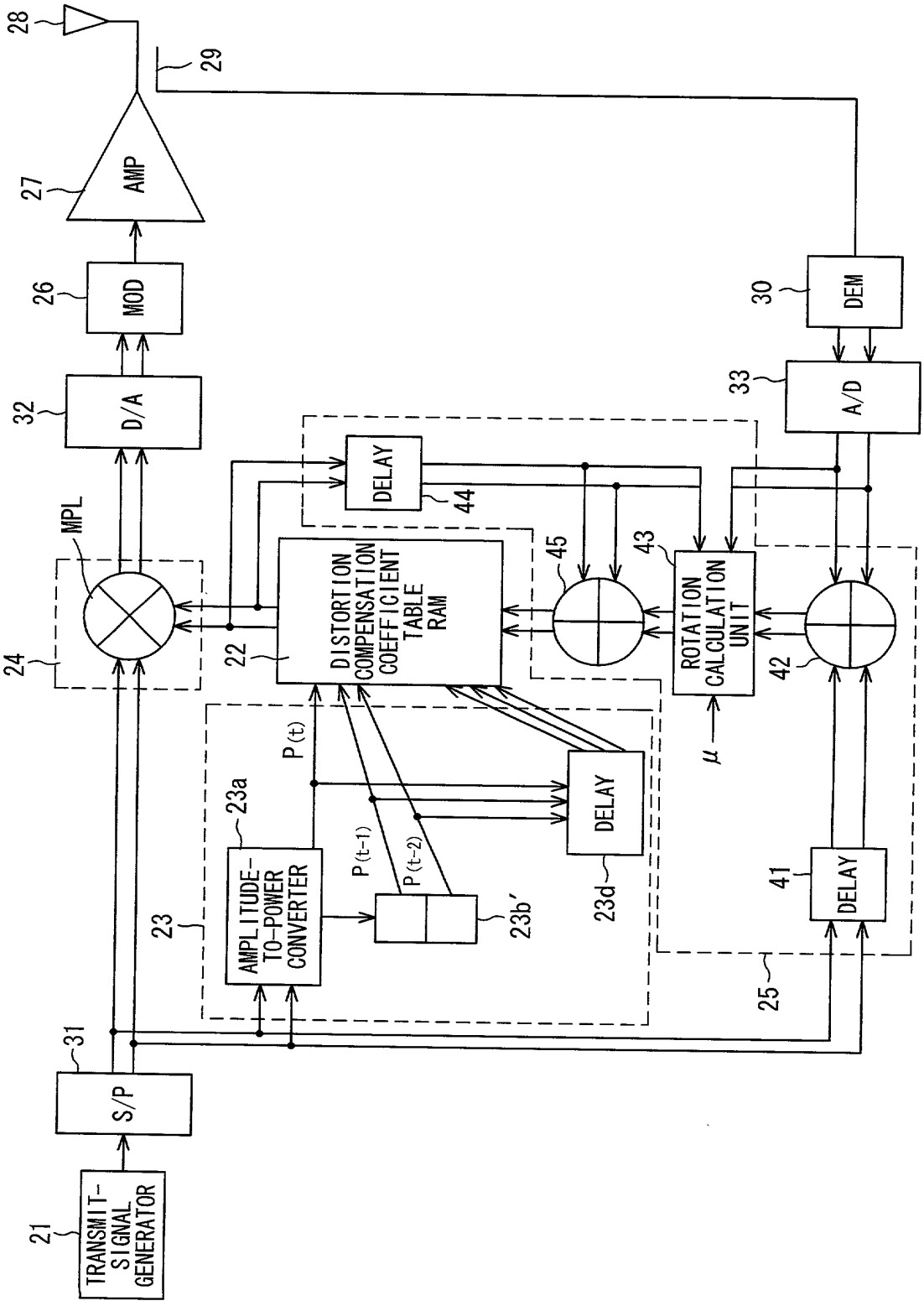

21
TRANSMIT-SIGNAL GENERATOR
31
S/P
23
23a
AMPLITUDE-TO-POWER CONVERTER
P(t)
P(t-1)
P(t-2)
23b'
DELAY
23d
22
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
24
MPL
32
D/A
26
MOD
27
AMP
28
29
DELAY
44
45
43
ROTATION CALCULATION UNIT
μ
42
DELAY
41
25
30
DEM
33
A/D

FIG. 15

$P_{(t)}$	$P_{(t-1)}$	$P_{(t-2)}$	$h(P_{(t)}, P_{(t-1)}, P_{(t-2)})$
P_1	P_1	P_1	$h(P_1, P_1, P_1)$
		P_2	$h(P_1, P_1, P_2)$
		:	:
		P_n	$h(P_1, P_1, P_n)$
	P_2	P_1	$h(P_1, P_2, P_1)$
		P_2	$h(P_1, P_1, P_2)$
		:	:
		P_n	$h(P_1, P_2, P_n)$
	⋮	⋮	⋮
	P_n	P_1	$h(P_1, P_n, P_1)$
		P_2	$h(P_1, P_n, P_2)$
		:	:
		P_n	$h(P_1, P_n, P_n)$
P_2	P_1	P_1	$h(P_2, P_1, P_1)$
		P_2	$h(P_2, P_1, P_2)$
		:	:
		P_n	$h(P_2, P_1, P_n)$
⋮	P_2	⋮	⋮
P_m	⋮		

FIG. 16

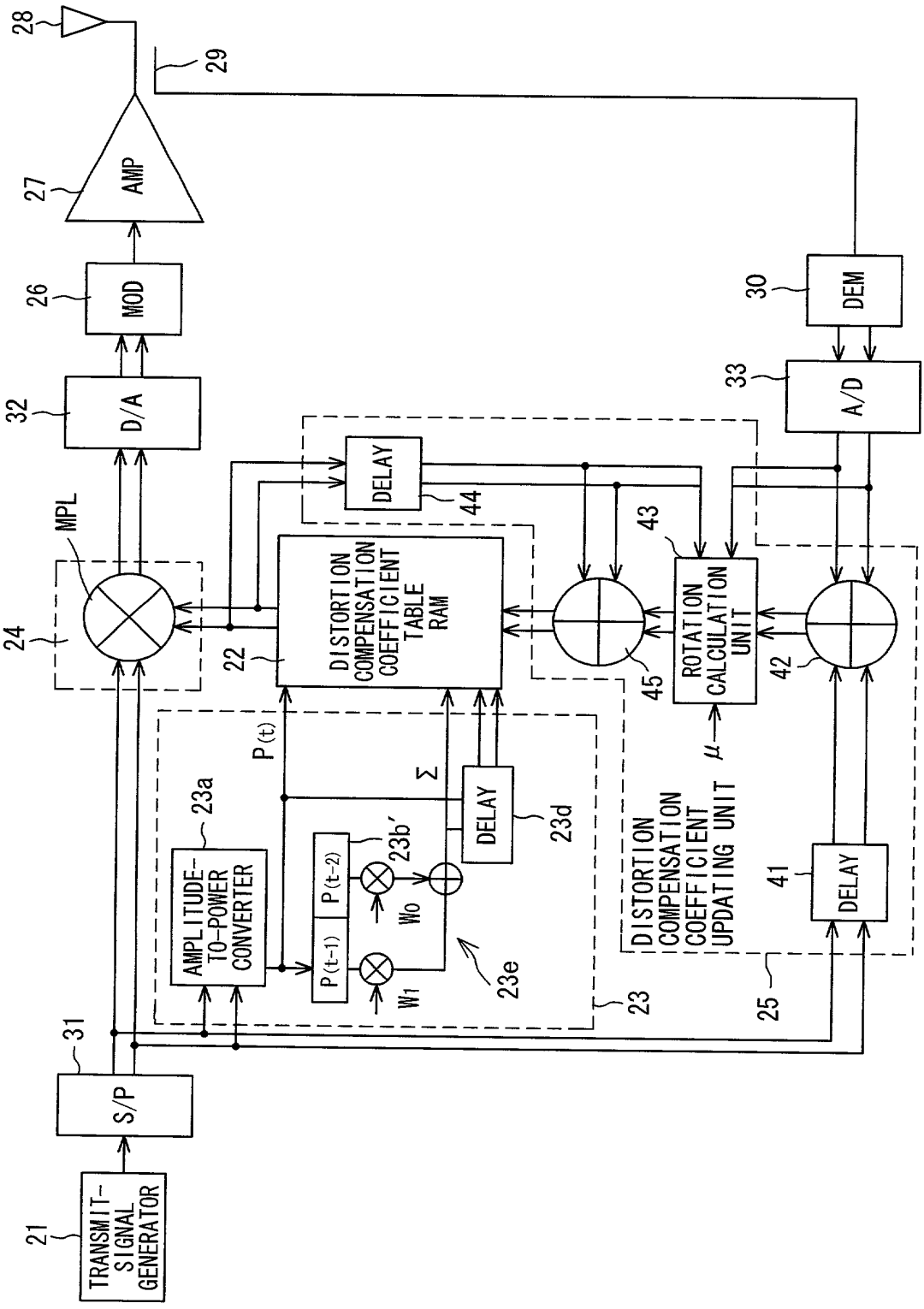

TRANSMIT-SIGNAL GENERATOR
21
S/P
31
AMPLITUDE-TO-POWER CONVERTER
23a
P(t)
P(t-1)
P(t-2)
23b'
W0
W1
Σ
DELAY
23d
23e
23
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
MPL
24
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
22
DELAY
44
ROTATION CALCULATION UNIT
43
45
μ
42
DELAY
41
25
D/A
32
MOD
26
AMP
27
28
29
A/D
33
DEM
30

FIG. 17

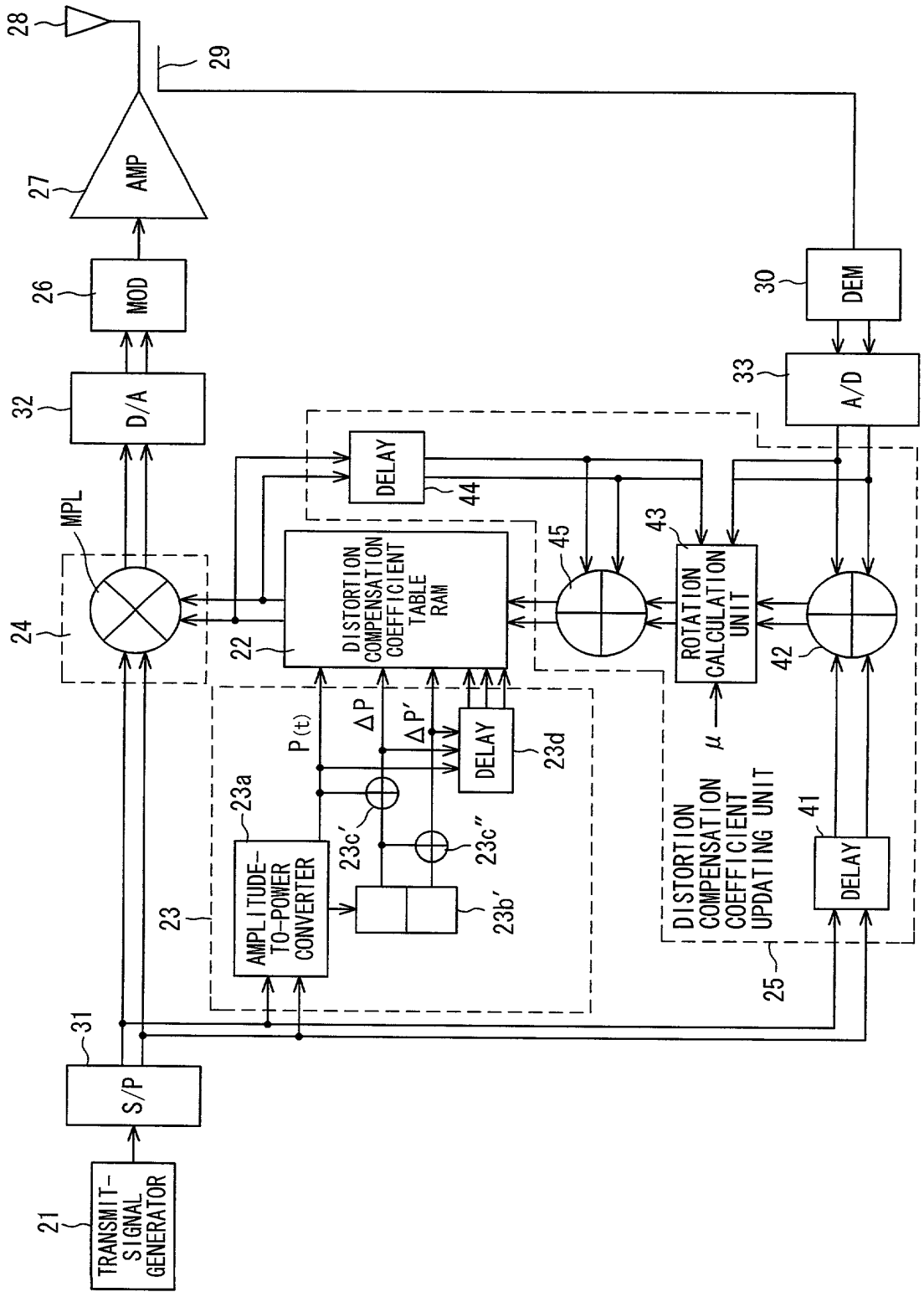

21
TRANSMIT-SIGNAL GENERATOR
31
S/P
23
23a
AMPLITUDE-TO-POWER CONVERTER
P(t)
ΔP
ΔP'
23c'
23c''
23b'
DELAY
23d
24
MPL
22
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
DELAY
44
45
43
ROTATION CALCULATION UNIT
μ
42
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
41
DELAY
32
D/A
26
MOD
27
AMP
28
29
30
DEM
33
A/D

FIG. 18

$P_{(t)}$	ΔP	$\Delta P'$	$h(P_{(t)}, \Delta P, \Delta P')$
P_1	ΔP_1	ΔP_1	$h(P_1, \Delta P_1, \Delta P_1)$
		ΔP_2	$h(P_1, \Delta P_1, \Delta P_2)$
		⋮	⋮
		ΔP_n	$h(P_1, \Delta P_1, \Delta P_n)$
	ΔP_2	ΔP_1	$h(P_1, \Delta P_2, \Delta P_1)$
		ΔP_2	$h(P_1, \Delta P_2, \Delta P_2)$
		⋮	⋮
		ΔP_n	$h(P_1, \Delta P_2, \Delta P_n)$
	⋮	⋮	⋮
	ΔP_n	ΔP_1	$h(P_1, \Delta P_n, \Delta P_1)$
		ΔP_2	$h(P_1, \Delta P_n, \Delta P_2)$
		⋮	⋮
		ΔP_n	$h(P_1, \Delta P_n, \Delta P_n)$
P_2	ΔP_1	ΔP_1	$h(P_2, \Delta P_1, \Delta P_1)$
		ΔP_2	$h(P_2, \Delta P_1, \Delta P_2)$
		⋮	⋮
		ΔP_n	$h(P_2, \Delta P_1, \Delta P_n)$
⋮	ΔP_2 ⋮	⋮	⋮
P_m			

FIG. 19

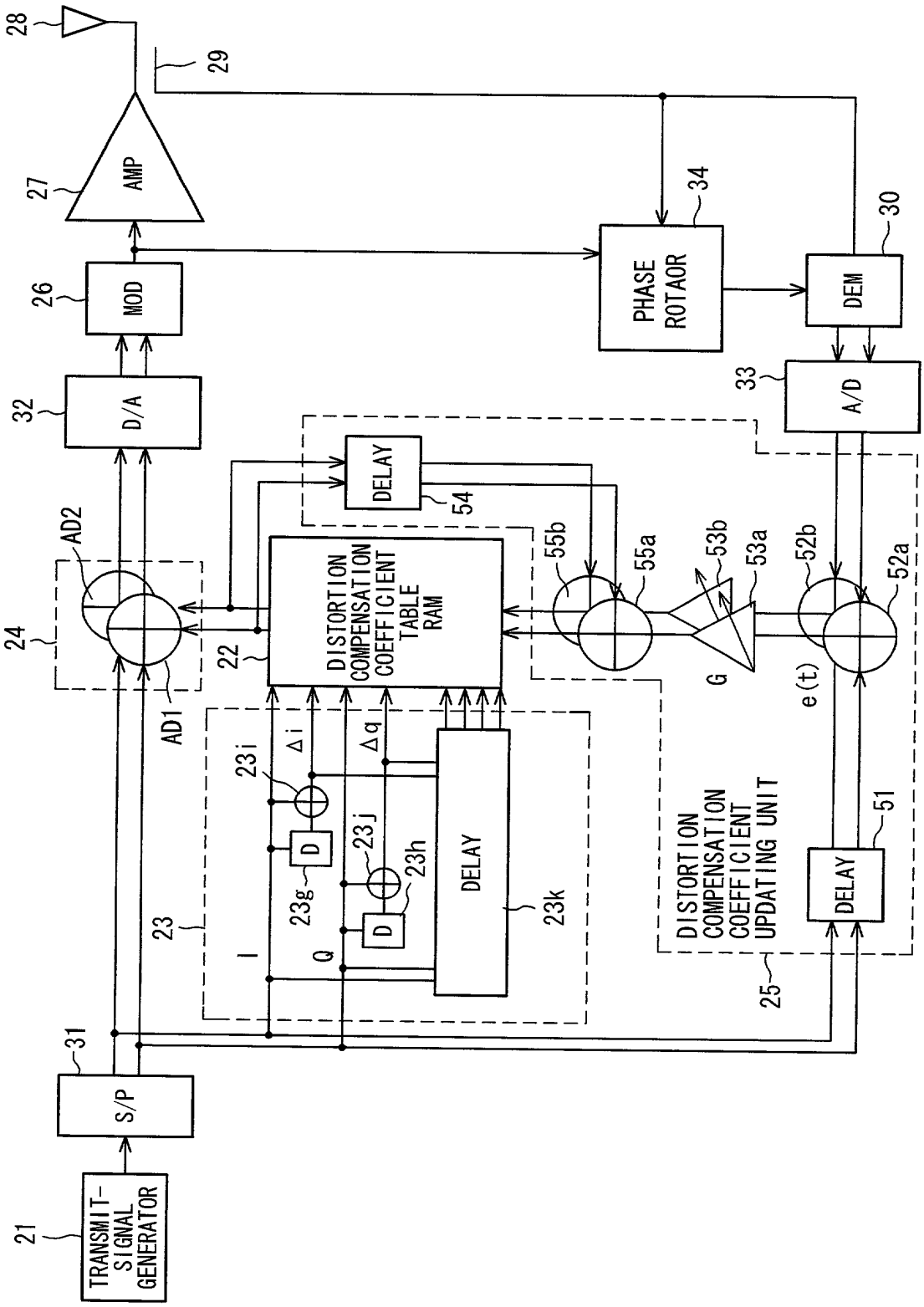

28
29
AMP
27
MOD
26
D/A
32
PHASE ROTAOR
34
DEM
30
A/D
33
DELAY
54
AD2
AD1
24
22
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
55b
55a
53b
53a
52b
52a
G
e(t)
23
23i
Δi
Δq
23j
23h
23g
D
D
DELAY
23k
I
Q
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
DELAY
51
S/P
31
TRANSMIT-SIGNAL GENERATOR
21

FIG. 20

(a)

$I_{(t)}$	Δi	$hi(I_{(t)}, \Delta i)$
I_1	Δi_1	$hi(I_1, \Delta i_1)$
	Δi_2	$hi(I_1, \Delta i_2)$
	Δi_3	$hi(I_1, \Delta i_3)$
	⋮	⋮
	Δi_n	$hi(I_1, \Delta i_n)$
I_2	Δi_1	$hi(I_2, \Delta i_1)$
	Δi_2	$hi(I_2, \Delta i_2)$
	Δi_3	$hi(I_2, \Delta i_3)$
	⋮	⋮
	Δi_n	$hi(I_2, \Delta i_n)$
I_3 ⋮	⋮	⋮
I_m	Δi_1	$hi(I_m, \Delta i_1)$
	Δi_2	$hi(I_m, \Delta i_2)$
	Δi_3	$hi(I_m, \Delta i_3)$
	⋮	⋮
	Δi_n	$hi(I_m, \Delta i_n)$

(b)

$Q_{(t)}$	Δq	$hq(Q_{(t)}, \Delta q)$
Q_1	Δq_1	$hq(Q_1, \Delta q_1)$
	Δq_2	$hq(Q_1, \Delta q_2)$
	Δq_3	$hq(Q_1, \Delta q_3)$
	⋮	⋮
	Δq_n	$hq(Q_1, \Delta q_n)$
Q_2	Δq_1	$hq(Q_2, \Delta q_1)$
	Δq_2	$hq(Q_2, \Delta q_2)$
	Δq_3	$hq(Q_2, \Delta q_3)$
	⋮	⋮
	Δq_n	$hq(Q_2, \Delta q_n)$
Q_3 ⋮	⋮	⋮
Q_n	Δq_1	$hq(Q_m, \Delta q_1)$
	Δq_2	$hq(Q_m, \Delta q_2)$
	Δq_3	$hq(Q_m, \Delta q_3)$
	⋮	⋮
	Δq_m	$hq(Q_m, \Delta q_n)$

FIG. 21

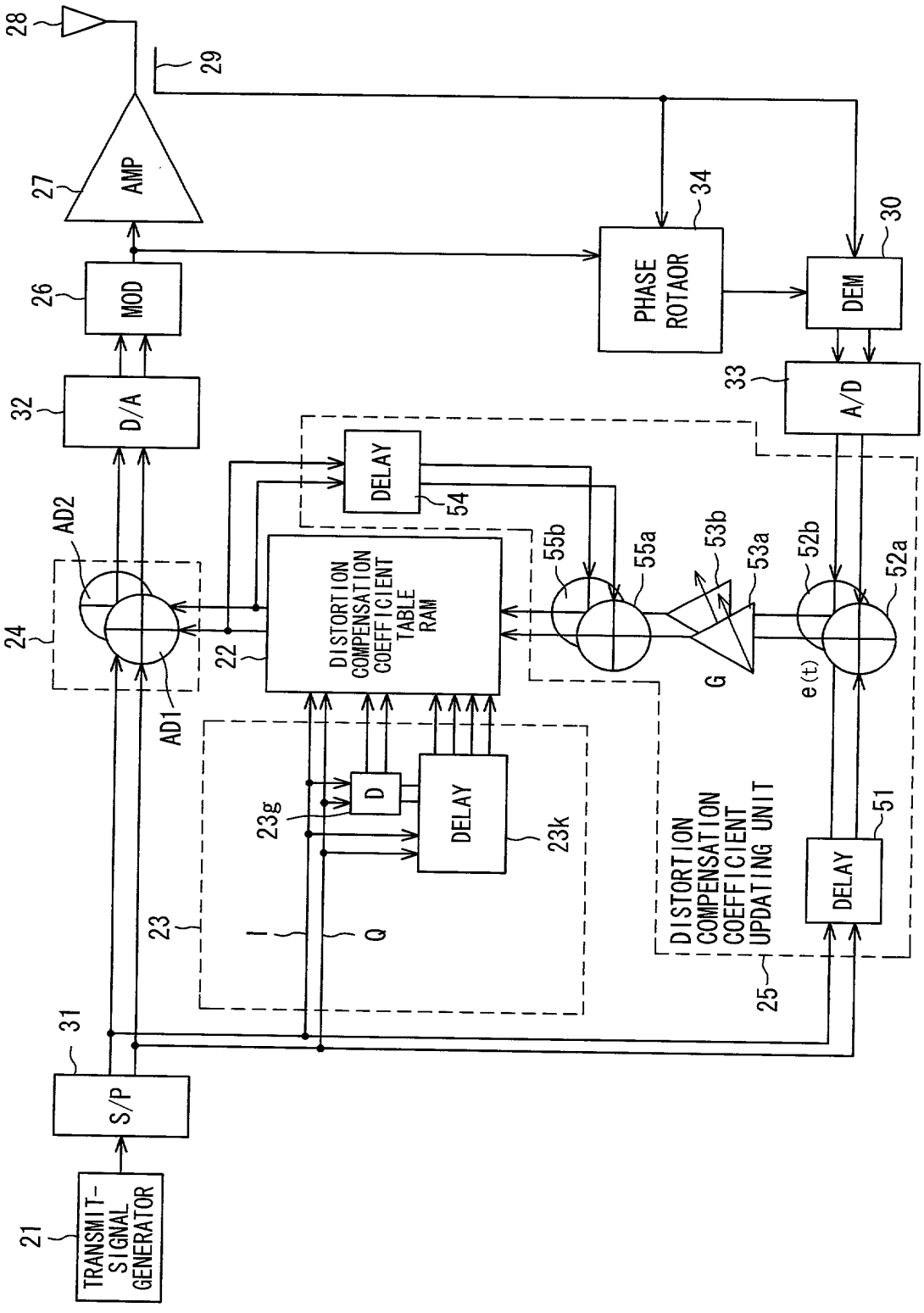

TRANSMIT-SIGNAL GENERATOR
21
S/P
31
AD1
AD2
24
D/A
32
MOD
26
AMP
27
28
29
PHASE ROTAOR
34
DEM
30
A/D
33
DELAY
54
DISTORTION COMPENSATION COEFFICIENT TABLE RAM
22
55b
55a
53b
53a
G
52b
52a
e(t)
23
23g
D
DELAY
23k
I
Q
DISTORTION COMPENSATION COEFFICIENT UPDATING UNIT
25
DELAY
51

FIG. 22

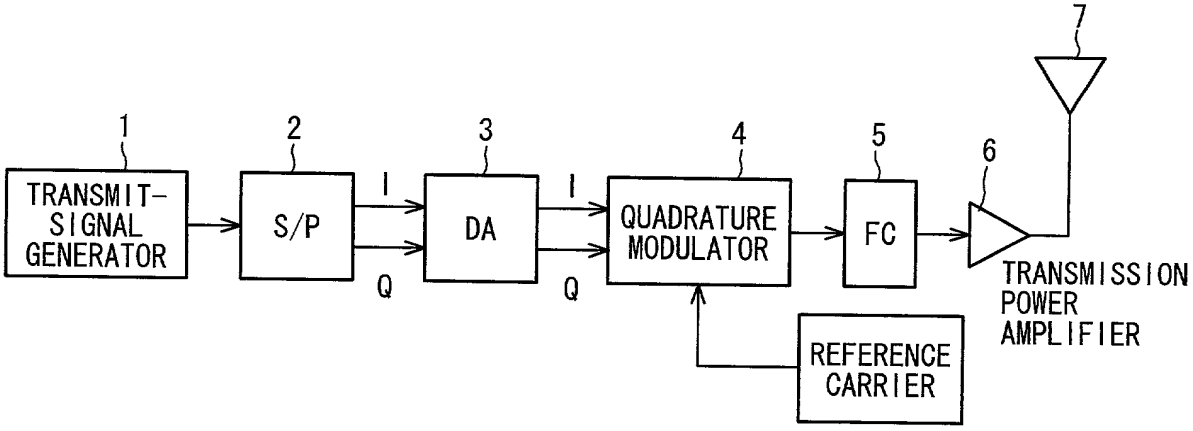

1
TRANSMIT-SIGNAL GENERATOR
2
S/P
I
Q
3
DA
I
Q
4
QUADRATURE MODULATOR
5
FC
6
7
TRANSMISSION POWER AMPLIFIER
REFERENCE CARRIER

FIG. 23

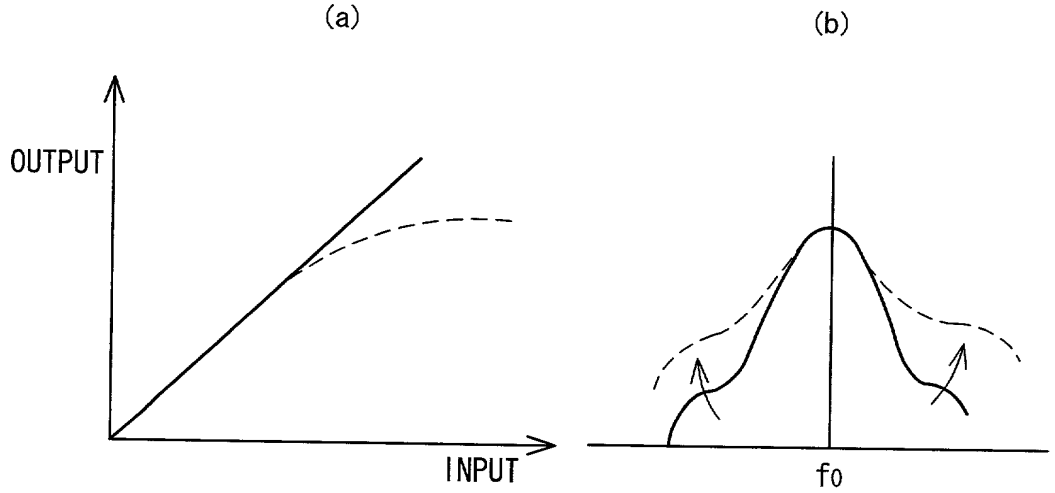

(a)
(b)
OUTPUT
INPUT
f0

FIG. 24

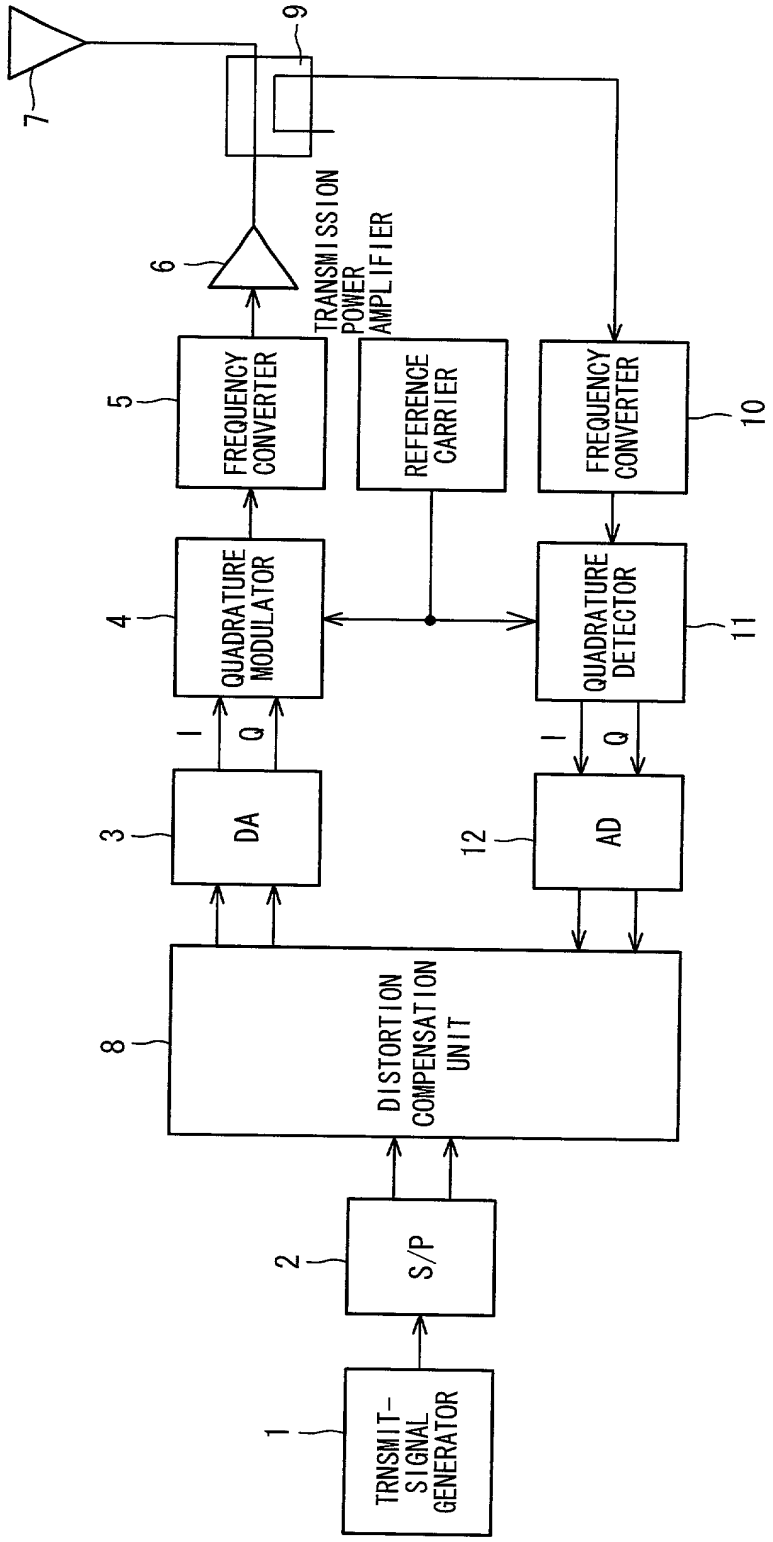

1
TRNSMIT-SIGNAL GENERATOR
2
S/P
8
DISTORTION COMPENSATION UNIT
3
DA
I
Q
4
QUADRATURE MODULATOR
5
FREQUENCY CONVERTER
6
TRANSMISSION POWER AMPLIFIER
7
9
REFERENCE CARRIER
FREQUENCY CONVERTER
10
QUADRATURE DETECTOR
11
12
AD
I
Q

FIG. 25

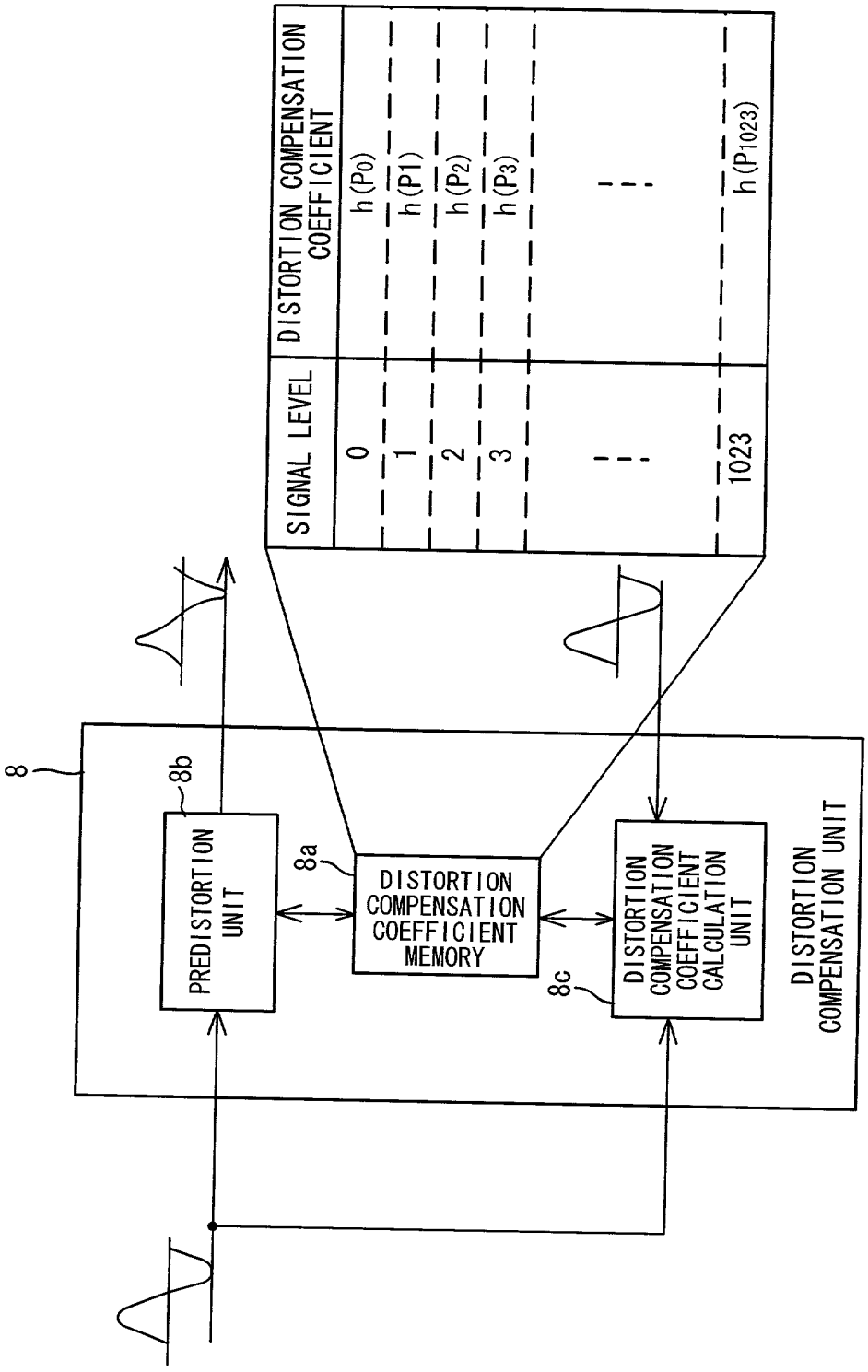

8
8b
PREDISTORTION UNIT
8a
DISTORTION COMPENSATION COEFFICIENT MEMORY
8c
DISTORTION COMPENSATION COEFFICIENT CALCULATION UNIT
DISTORTION COMPENSATION UNIT
SIGNAL LEVEL
DISTORTION COMPENSATION COEFFICIENT
0
1
2
3
1023
h(P0)
h(P1)
h(P2)
h(P3)
h(P1023)

FIG. 26

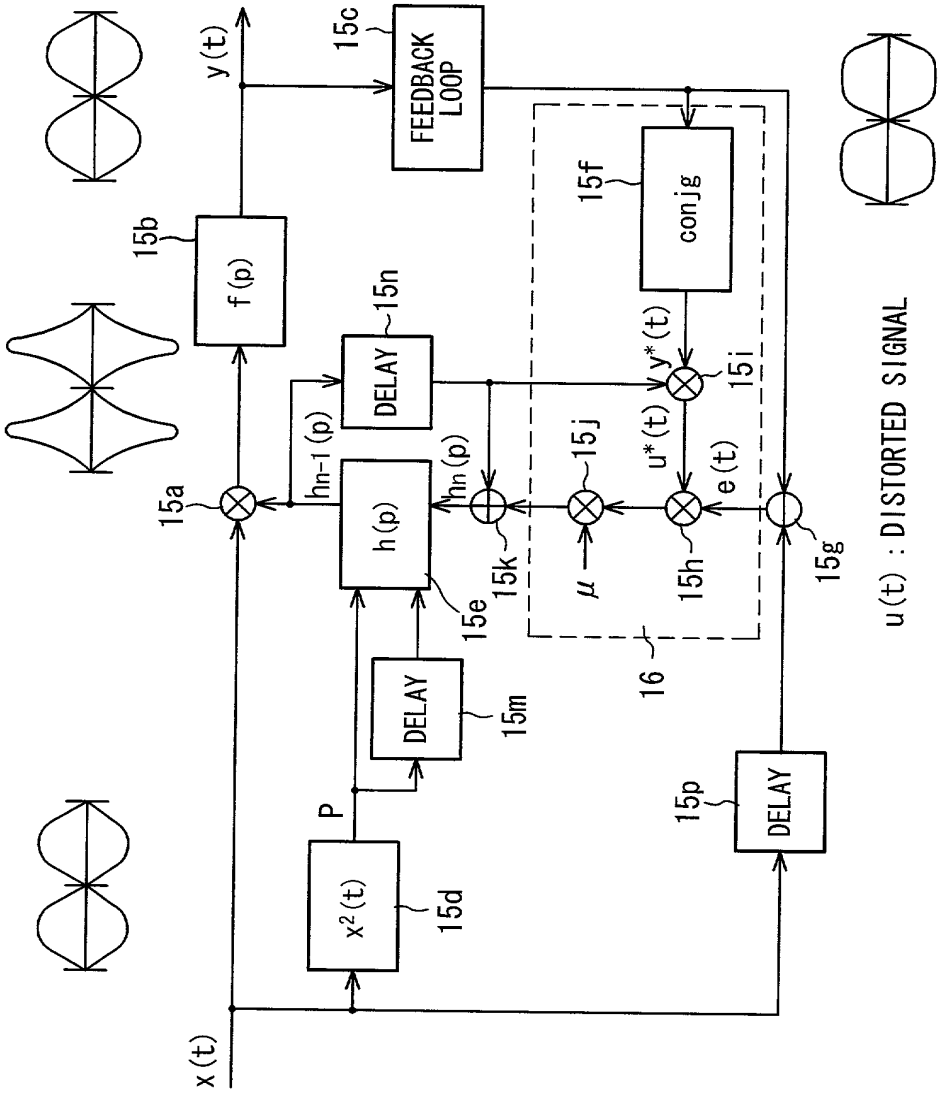

x(t)
y(t)
15a
15b
f(p)
15c
FEEDBACK LOOP
15d
x²(t)
P
15e
h(p)
hn-1(p)
hn(p)
15k
15m
DELAY
15n
DELAY
15f
conjg
y*(t)
15i
u*(t)
e(t)
15h
15j
μ
16
15g
15p
DELAY
u(t) : DISTORTED SIGNAL

FIG. 27

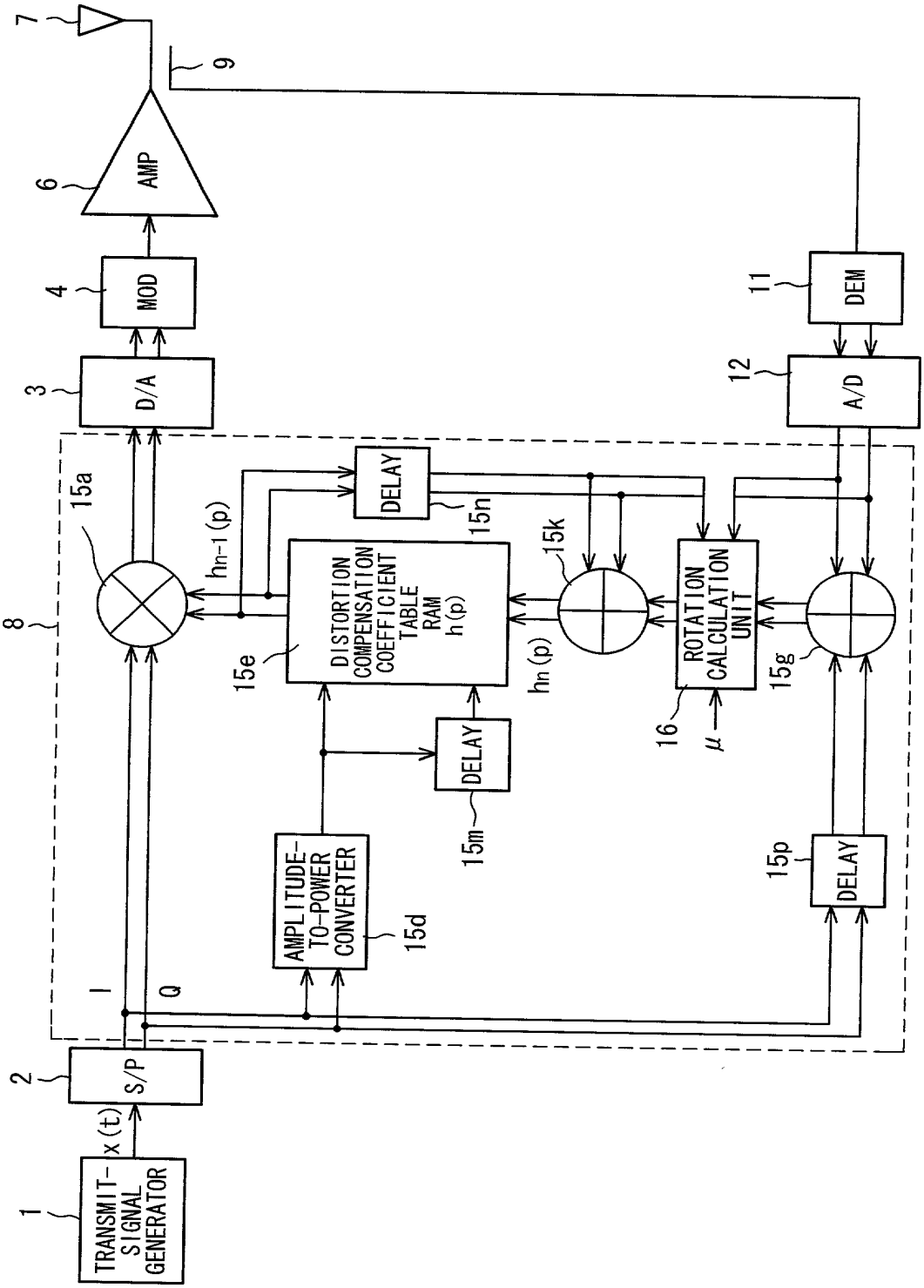
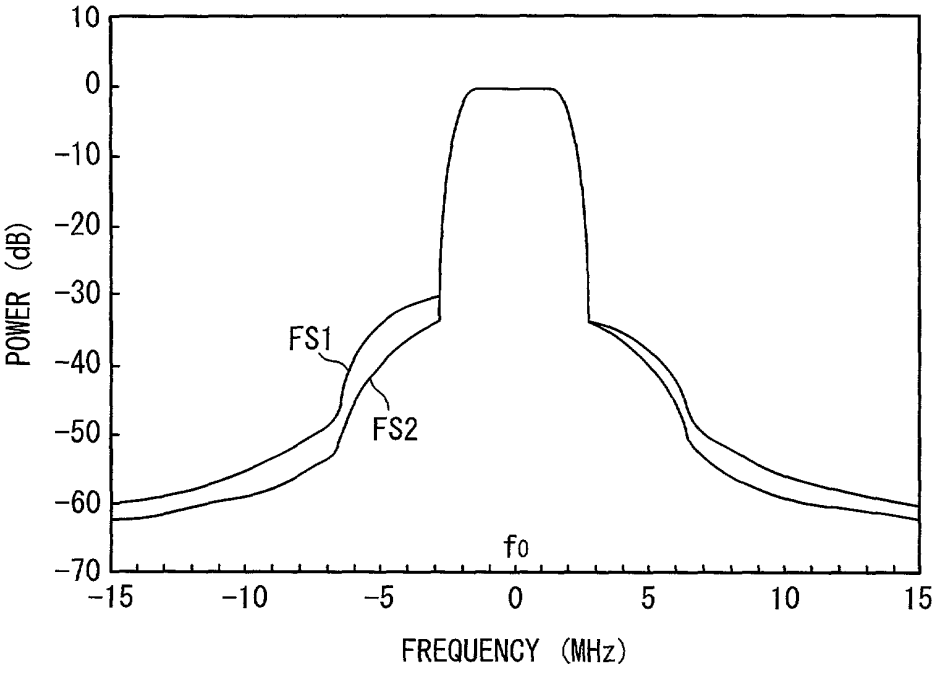

1
TRANSMIT-SIGNAL GENERATOR
x(t)
2
S/P
I
Q
3
D/A
4
MOD
6
AMP
7
9
8
15a
hn-1(p)
DELAY
15n
DISTORTION COMPENSATION COEFFICIENT TABLE RAM h(p)
15e
15k
hn(p)
ROTATION CALCULATION UNIT
16
μ
15g
DELAY
15m
AMPLITUDE-TO-POWER CONVERTER
15d
15p
DELAY
11
DEM
12
A/D

FIG. 28


10
0
-10
-20
-30
-40
-50
-60
-70
POWER (dB)
FS1
FS2
f0
-15
-10
-5
0
5
10
15
FREQUENCY (MHz)